

# Review of the ant genus *Anochetus* Mayr, 1861 (Hymenoptera, Formicidae) from China, with revival of the valid status of *Anochetus gracilis*

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## Abstract

Eight species of the ant genus *Anochetus* are recognized in China: *A. graeffei* Mayr, *A. lanyuensis* Leong et al., *A. longus* **sp. n.**, *A. madaraszi* Mayr, *A. mixtus* Radchenko, *A. medogensis* **sp. n.**, *A. risii* Forel, *A. subcoecus* Forel. *A. taiwaniensis* Terayama, 1989 is proposed as a junior synonym of *A. risii* Forel, 1900. *Anochetus gracilis* Karavaiev, 1925 is restored from synonymy of *A. risii*. A key based on the worker caste is provided for the Chinese species.

## Keywords

Formicidae, *Anochetus*, new species, new record, China

## Introduction

The genus *Anochetus* belongs to the tribe Ponerini, and constitutes as the sister group to *Odontomachus* (Bolton 2018, Schmidt 2013). A total of 113 extant species and 8 fossil ones have so far been known in the world (Bolton 2018), and the genus is especially

species-rich in the tropical and subtropical regions, except for a few species extending into temperate areas (Brown 1978). The first comprehensive revision of the genus was provided by Brown (1978), in which 12 new species were described, one genus-level and 38 species-level synonyms were solved, and 22 species groups were proposed. After his outstanding work, a series of studies further contributed to our understanding of the genus *Anochetus* and especially in the last decade. Eight fossil species are described from Dominican (Baroni Urbani 1980, De Andrade 1994, Mackay 1991). Twenty-eight species are described from five zoogeographic regions: eleven in the Malagasy Region (Fisher and Smith 2008, Shattuck and Slipinska 2012), four in the Neotropical Region (Lattke 1987, González-Campero and Elizalde 2008, Feitosa et al. 2012), three in the Palearctic Region (Terayama 1996, Kugler and Ionescu 2007, Sharaf et al. 2017), and five from the Indo-Australian Region and Oriental Region (Terayama 1989, Nuril Aida and Idris 2011, Zettel 2012, Bharti and Wachkoo 2013, Marathe and Priyadarsanan 2016, Leong et al. 2018), respectively. Besides, *A. ruginotus* Stitz, 1925 was revived from synonymy of *A. graeffei* Mayr, 1870 by Zettel (2012), and *A. yunnanensis* Wang, 1993 was proposed as junior synonym with *A. mixtus* Radchenko, 1993 by Satria et al. (2017).

The Chinese fauna of the genus was treated by Forel (1900), Wheeler (1928, 1930), Terayama (1989, 2009), Radchenko (1993), Wang (1993), Wu and Wang (1995), Tang et al. (1995), Xu et al. (1998, 1999), Xu (1999, 2002), Zhou (2001), Hua (2006), Lyu (2008), Zhang and Hou (2009), Satria et al. (2017) and Leong et al. (2018). Despite all taxonomic treatments mentioned above, only six species are confirmed to occur in China. However, the species diversity of *Anochetus* in China seems to be far from well-known if considering the complexity and heterogeneity of geography and climate throughout the country.

In this paper, two new species are described, *Anochetus longus* sp. n. and *A. medogensis* sp. n., while *A. madaraszsi* is newly recorded from China. *Anochetus taiwaniensis* Terayama, 1989 is proposed as a junior synonym of *A. risii* Forel, 1900, whereas *A. gracilis* Karavaiev, 1925 is revived from synonymy of *A. risii*. A key to Chinese species based on the worker caste is also provided.

## Materials and methods

The holotypes, paratypes and all non-type specimens examined are deposited or will be deposited in the following institutions.

- GXNU** Insect Collection, Guangxi Normal University, Guilin, Guangxi, China.  
**SWFU** Insect Collection, Southwest Forestry University, Kunming, Yunnan Province, China.  
**IZCAS** Institute of Zoology, Chinese Academy of Sciences, Beijing, China.

Images of the type specimens available on the AntWeb ([http:// www.antweb.org](http://www.antweb.org)) were examined. The specimens are examined with a Leica M205A stereomicroscope.

High-quality multifocused montage images were produced with Leica DFC 450 digital imaging system and Leica Application Suite V4.3 software. All measurements are given in millimeters. Standard measurements and indices are mostly as defined by Bolton (1975).

<b>CI</b>	Cephalic index = $HW \times 100 / HL$ .
<b>DPI</b>	Dorsal petiole index = $DPW \times 100 / PL$ .
<b>DPW</b>	Maximum width of petiole in dorsal view.
<b>ED</b>	Maximum diameter of eye.
<b>HL</b>	Straight-line length of head in perfect full-face view, measured from the mid-point of the anterior clypeal margin to the midpoint of the posterior margin. In species where one or both of these margins are concave, the measurement is taken from the mid-point of a transverse line that spans the apices of the projecting portions.
<b>HW</b>	Maximum width of head in full-face view, excluding the eyes.
<b>LPI</b>	Lateral petiole index = $PH \times 100 / PL$ .
<b>MSL</b>	Diagonal length of the mesosoma in lateral view, measured from the point at which the pronotum meets the cervical shield to the posterior basal angle of the metapleuron.
<b>PH</b>	Height of petiole measured in lateral view from the apex of the ventral (subpetiolar) process vertically to a line intersecting the dorsalmost point of the node.
<b>PL</b>	Length of petiole measured in lateral view from the anterior process to the posteriormost point of the tergite, where it surrounds the gastral articulation.
<b>PW</b>	Maximum width of pronotum measured in dorsal view.
<b>SI</b>	Scape index = $SL \times 100 / HW$ .
<b>SL</b>	Straight-line length of the antennal scape, excluding the basal constriction or neck.
<b>TL</b>	Total outstretched length of the individual, from the mandibular apex to the gastral apex.

### Key to Chinese species of *Anochetus* based on the worker caste

- 1 Apical portion of mandible with three strong teeth; inner mandibular margin without denticles except preapical tooth (Figs 1B–3B, 4B, 10B) ..... **2**
- Apical portion of mandible only with two distinct teeth; inner mandibular margin with some distinct denticles (Figs 5B–7B)..... **6**
- 2 Scape surpassing to posterior corner of head by about its 1/7 length (Fig. 3A); large species ( $TL \geq 8.35$ ); mesosoma comparatively thinner (Fig. 3D) ..... *A. longus* sp. n.
- Scape not or just reaching to posterior corner of head (Figs 1A–2A, 4A, 10A); small species ( $TL \leq 6.0$ ); mesosoma comparatively stouter (Figs 1D–2D, 4D, 10D)..... **3**

- 3 The maximum diameter of eye narrower than the width of scape at its midlength (Fig. 10A); the junction between propodeal dorsum and declivity forming a pair of denticles laterally (Fig. 10D); pronotum smooth and shining (Fig. 10C) ..... *A. subcoecus*
- The maximum diameter of eye broader than the width of scape at its midlength (Figs 1A–2A, 4A); the junction between propodeal dorsum and declivity rounded, not forming a pair of denticles laterally (Figs 1D–2D, 4D); pronotum strongly rugose (Figs 1C–2C, 4C) ..... 4
- 4 Pronotal disc longitudinally striate (Fig. 2C); posterior half of pronotum to mesonotum straight (Fig. 2D); dorsal margin of petiolar node concave in anterior view ..... *A. lanyuensis*
- Pronotal disc irregularly striate (Figs 1C, 4C); posterior one third of pronotum to mesonotum weakly convex or weakly concave at metanotal groove (Figs 1D, 4D); dorsal margin of petiolar node weakly convex in anterior view ..... 5
- 5 Head slightly longer than broad (CI 95); mesonotum transversely striate; petiole thick, twice as high as long (Fig. 4D) ..... *A. madaraszi*
- Head distinctly longer than broad (CI 89); mesonotum transversely reticulate; petiole thin, 3.7 times as high as long (Fig. 1D) ..... *A. graeffei*
- 6 Whole pronotum coarsely rugose (Fig. 6C) ..... *A. mixtus*
- Middle portion of pronotum smooth and shining (Figs 5C, 7C) ..... 7
- 7 In full-face view, inner mandibular margin with about 11 denticles, preapical five denticles equal-sized; scapes with sparse suberect hairs; mesonotum with a strong transverse ridge anteriorly, situated higher than pronotum; metapleuron striate (Fig. 5) ..... *A. medogensis* sp. n.
- In full-face view, inner mandibular margin with 5–8 denticles, preapical denticle distinctly larger than the others; scapes with abundant decumbent hairs; mesonotum without anterior transverse ridge, metapleuron smooth and shining (Fig. 7) ..... *A. risii*

## Taxonomic account of Chinese species of *Anochetus*

### *Anochetus graeffei* Mayr, 1870

Fig. 1

*Anochetus graeffei* Mayr, 1870: 961. [Lectotype worker images examined, AntWeb, CASENT0915887, photos by Harald Bruckner].

*Anochetus punctiventris* Mayr, 1879: 659. Synonymized by Wilson, 1959: 507. [Syntype worker images examined, AntWeb, CASENT0915888, photos by Harald Bruckner].

*Anochetus rudis* Emery, 1889: 499. Synonymized by Brown, 1978: 577. [Syntype worker images examined, AntWeb, CASENT0903978, photos by Zach Lieberman].

*Anochetus punctiventris* subsp. *oceanicus* Emery, 1897: 597. Synonymized by Wilson, 1959: 507. [Syntype worker images examined, AntWeb, CASENT0903977, photos by Zach Lieberman].

**Non-type material examined.** 5 workers, CHINA, Hainan, Qiongzong County, Mt. Limushan, 19.17N, 109.71E, 681 m, 03.IV.2016, leg. Zhilin Chen, No. G160161; 4 workers, 1 male and 1 queen from the same colony, CHINA, Guangxi, Chongzuo City, Zuozhou Village, Pairutun, 22.56N, 107.41E, 222 m, 11.VI.2016, leg. Zhilin Chen, No. G160056; 2 workers, CHINA, Guangxi, Shangsi County, Hongqi Forest Farm, 03.VII.2001, leg. Shanyi Zhou, No. G010062.

**Workers.** TL 4.40–4.91, HL 1.09–1.13, HW 0.98–1.00, CI 86–89, SL 0.80–0.83, SI 82–84, ED 0.14–0.17, PW 0.58, MSL 1.35, PL 0.27–0.28, PH 0.46–0.48, DPW 0.27–0.29, LPI 57–58, DPI 99–100 (n = 5).

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin without denticles; apical portion with three distinct teeth. Antennae 12-segmented; scapes just reaching to posterior corners of head. Eyes moderate-size, maximum diameter equal to the width of mandible at its base.

In lateral view mesosoma stout, dorsal outline of pronotum convex and gradually sloping anteriorly. Promesonotal suture indistinct dorsally and laterally. Dorsal outline of mesonotum and propodeum almost straight, posterolateral corners of propodeum forming obtuse triangle. Metanotal groove broadly impressed. Petiole thin, distinctly higher than long, narrowing dorsally, anterior margin straight, posterior margin distinctly convex; subpetiolar process developed, anterior margin straight, posteroventral margin rounded. Dorsal margin of petiole weakly convex in anterior view.

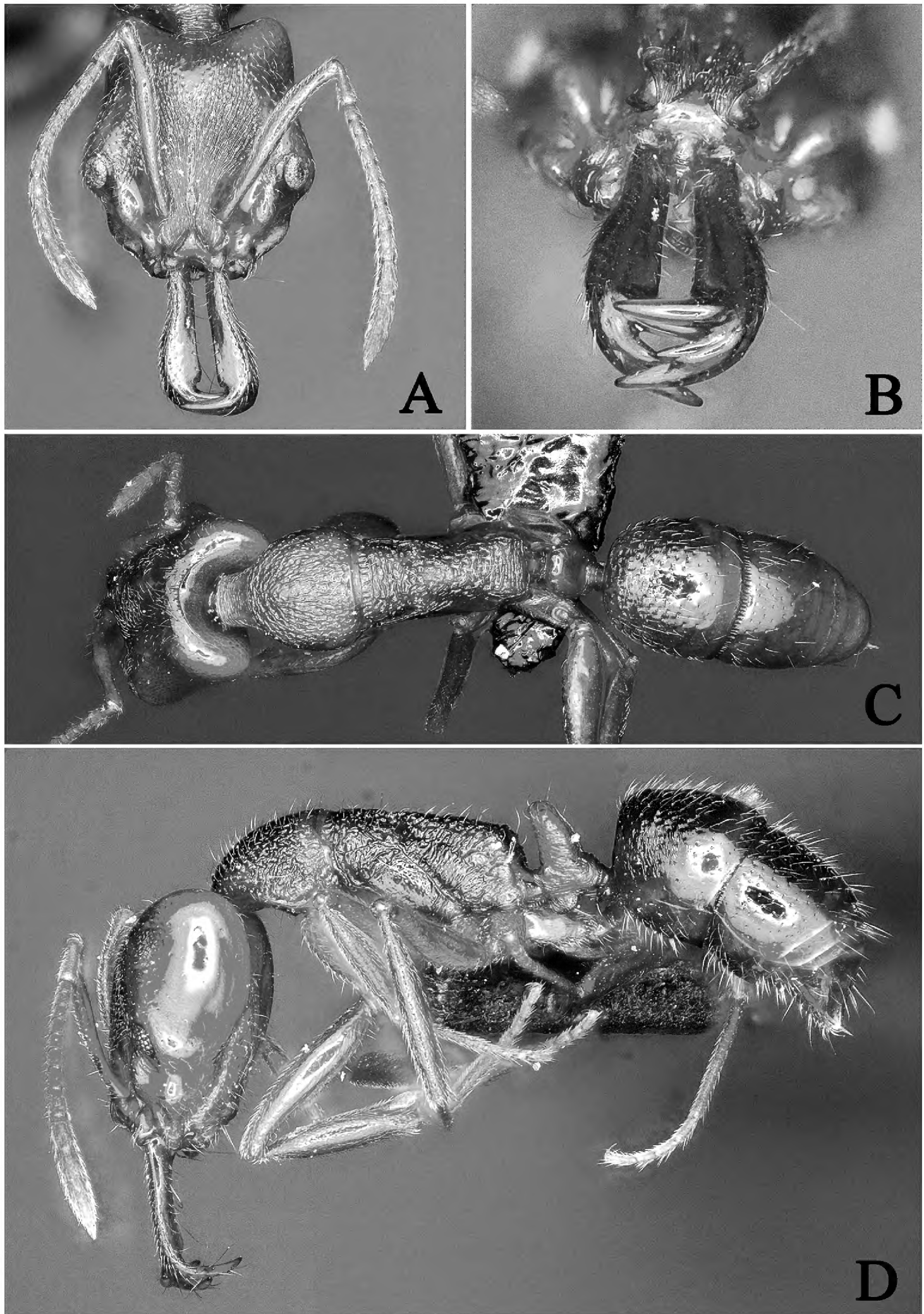
Frons and anterior part of vertex longitudinally striate; remainder of head smooth and shining. Frontal lobes weakly striate. Mesosoma irregularly rugose, rugae on pronotal disc inverted U-shaped rugae, metapleuron rugose, sides and declivity of propodeum transversely rugose. Petiolar node smooth and shiny except basal area faintly striate. Gaster smooth and shining, except distinctly punctate first gastral tergite.

Dorsum of body with abundant suberect to subdecumbent hairs and decumbent pubescence, hairs on cephalic dorsum sparse; scapes and tibiae with dense decumbent pubescence. Body reddish brown to brown; antennae, legs and petiole yellowish brown.

**Recognition.** The species is similar to *A. lanyuensis* Leong et al., 2018, *A. validus* Bharti et Wachkoo, 2013 and *A. victoriae* Shattuck et Slipinska, 2012, but well separated from them by the following characters: dorsal outline of pronotum gradually sloping anteriorly, not forming a straight outline with mesonotum and propodeum; pronotal disc with dense inverted U-shaped rugae; scapes just reaching to posterior corner of head.

**Distribution.** Known from southern India east through SE Asia to Australia and onwards to the Cook Islands (Shattuck and Slipinska 2012). In China, the species is distributed in Fujian, Guangxi, Hainan and Yunnan.





**Figure 1.** *Anochetus graeffei* worker (No. G160161). **A** head in full-face view **B** mandible in anterior view **C** body in dorsal view **D** body in lateral view.

***Anochetus lanyuensis* Leong, Tsai, Terayama, Shiao & Lin, 2018**

Fig. 2

*Anochetus lanyuensis* Leong, Tsai, Terayama, Shiao & Lin, 2018: 125. [Holotype worker images examined, cited from Leong et al., 2018, photos by Chi-Man Leong].

**Workers.** TL 5.33–5.84, HL 1.23–1.32, HW 1.16–1.23, CI 93–98, SL 1.00–1.09, SI 82–89, ED 0.16–0.21, PW 0.65–0.70, MSL 1.54–1.72, PL 0.27–0.32, PH 0.52–0.61 (n=7) (After Leong et al., 2018).

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin without denticles; apical portion with three distinct teeth. Antennae 12-segmented; scapes not exceeding to posterior corners of head. Eyes moderate-size.

In lateral view mesosoma stout, dorsal outline of posterior half of pronotum and mesonotum straight. Posterolateral corners of propodeum obtusely angulate. Petiole thin, distinctly higher than long, with acute triangular tip; anterior margin straight, posterior margin distinct convex; subpetiolar process developed with subtriangular ventral margin. Dorsal margin of petiole weakly concave in anterior view.

Frons and anterior part of vertex longitudinally striate extending to posterior lobes of head, remainder of head smooth and shining. Clypeus smooth and shining. Pronotum longitudinally striate. Mesonotum and propodeum transversely striate. mesopleuron smooth and shining. Petiolar node smooth and shiny except basal area faintly striate. Gaster smooth and shining.

Dorsum of body with abundant erect to suberect hairs and abundant decumbent pubescence; scapes and tibiae with scattered subdecumbent hairs dense pubescence. Body reddish brown; antennae, legs and petiole yellowish brown.

**Recognition.** The species is similar to *A. ruginotus* Stitz, 1925, but can be distinguished from the latter by the following characters: eyes larger with 12 ommatidia along the maximum diameter; dorsal outline of mesosoma straight.

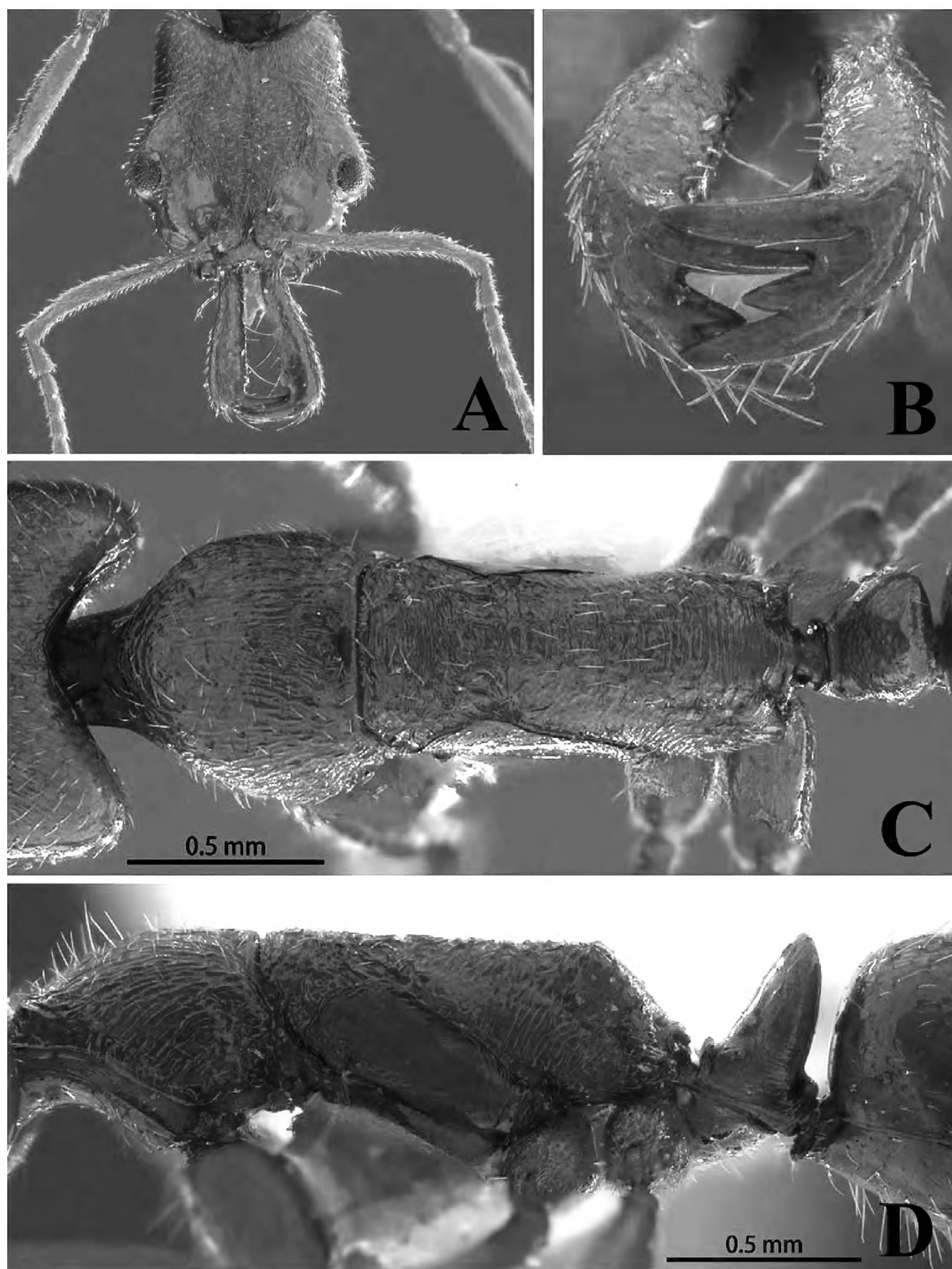
**Distribution.** Known only from the type locality – Orchid Island of Taiwan.

***Anochetus longus* sp. n.**

<http://zoobank.org/ED24B483-30F4-4B90-AE97-359ABBE644C8>

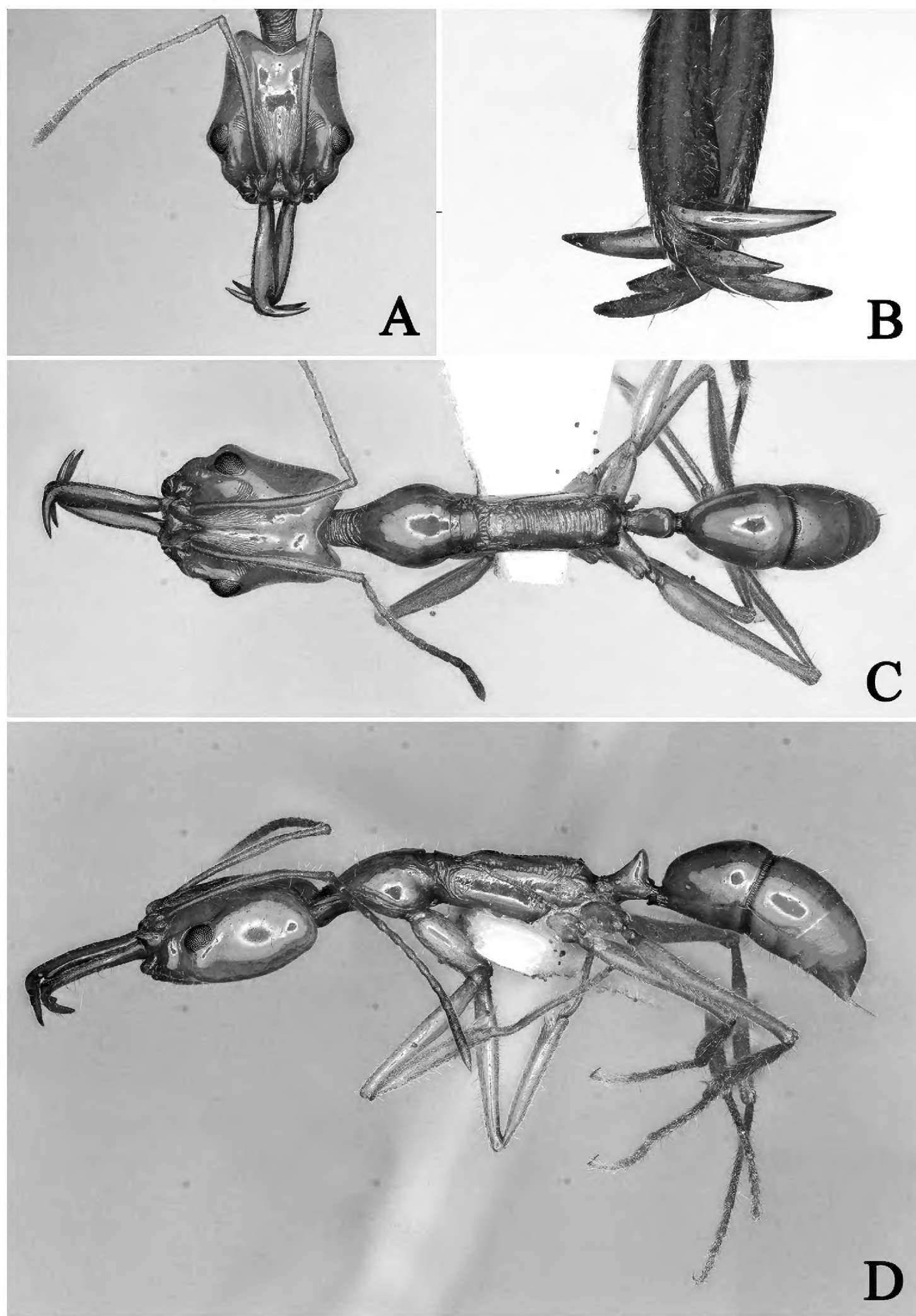
Fig. 3

**Type material.** Holotype worker, CHINA, Guangxi, Fanchenggang City, Fulong Village, 22.VI.2015, leg. Zhilin Chen, No. G150887; 3 paratype workers from the same colony. [holotype worker and 1 paratype worker are deposited in the Insect Collection, Guangxi Normal University, Guilin, China (GXNU); 1 paratype worker will be deposited in the Insect Collection, Southwest Forestry University, Kunming, Yunnan Province, China (SWFU); 1 paratype worker will be deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS)].



**Figure 2.** *Anochetus lanyuensis* holotype worker (Cited from Leong et al., 2018). **A** head in full-face view **B** mandible in anterior view **C** mesosoma in dorsal view **D** mesosoma in lateral view.





**Figure 3.** *Anochetus longus* holotype worker (No. G150887). **A** head in full-face view **B** mandible in anterodorsal view **C** body in dorsal view **D** body in lateral view.

**Holotype worker.** TL 8.56, HL 1.88, HW 1.59, CI 85, SL 1.80, SI 113, ED 0.33, PW 0.88, MSL 2.70, PL 0.54, PH 0.61, DPW 0.34, LPI 113, DPI 63.

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin without denticles, apical portion with three distinct teeth. Anterior margin of clypeus gently concave. Antennae 12-segmented; scapes long, surpassing to posterior corners of head by about 1/7 of its length. Maximum diameter of eye wider than apical width of mandible.

In lateral view mesosoma slender, pronotum weakly convex. Promesonotal suture narrowly weakly notched. Mesonotum short and sloping posteriorly. Mesonotum groove widely depressed. Propodeal dorsum weakly concave, posterolateral corners of propodeum forming a pair of small teeth. Petiole triangular and stout, anterior margin slightly concave, posterior margin convex, anterior margin longer than posterior margin, dorsal apex acutely angulate; subpetiolar process developed, subtriangular.

Frons with striae running in a fan shape, remainder of head smooth and shining. Mesosoma smooth and shining, pronotum with transverse striae on pronotal neck, dorsa of mesonotum and propodeum transversely striate. Petiolar node smooth and shiny except lower half area faintly striate. Gaster smooth and shining.

Dorsum of body with scattered erect hairs; mandibles with abundant subdecumbent pubescence; scapes and tibiae with sparse suberect hairs and dense decumbent pubescence. Body yellowish brown; legs brownish yellow.

**Paratype workers.** TL 8.35–8.59, HL 1.88–1.89, HW 1.59, CI 84–85, SL 1.80–1.83, SI 113–115, ED 0.33–0.35, PW 0.85–0.88, MSL 2.63–2.70, PL 0.53–0.54, PH 0.59–0.61, DPW 0.34–0.36, LPI 110–113, DPI 63–65 ( $n = 3$ ). As holotype.

**Recognition.** The new species is similar to *A. rufus* (Jerdon, 1851), but well separated from the latter by the following characters: sides of pronotum smooth and shining; metanotal groove widely depressed; junction of propodeal dorsum and declivity forming a pair of small lateral teeth; the constriction between AIII and AIV with short ridges.

The new species is also similar *A. agilis* Emery, 1901, but well separated from the latter by the following characters: mesonotum smooth and shining; junction of propodeal dorsum and declivity forming a pair of small lateral teeth; petiolar node narrowly pointed at apex; the constriction between AIII and AIV with short ridges; body yellowish brown.

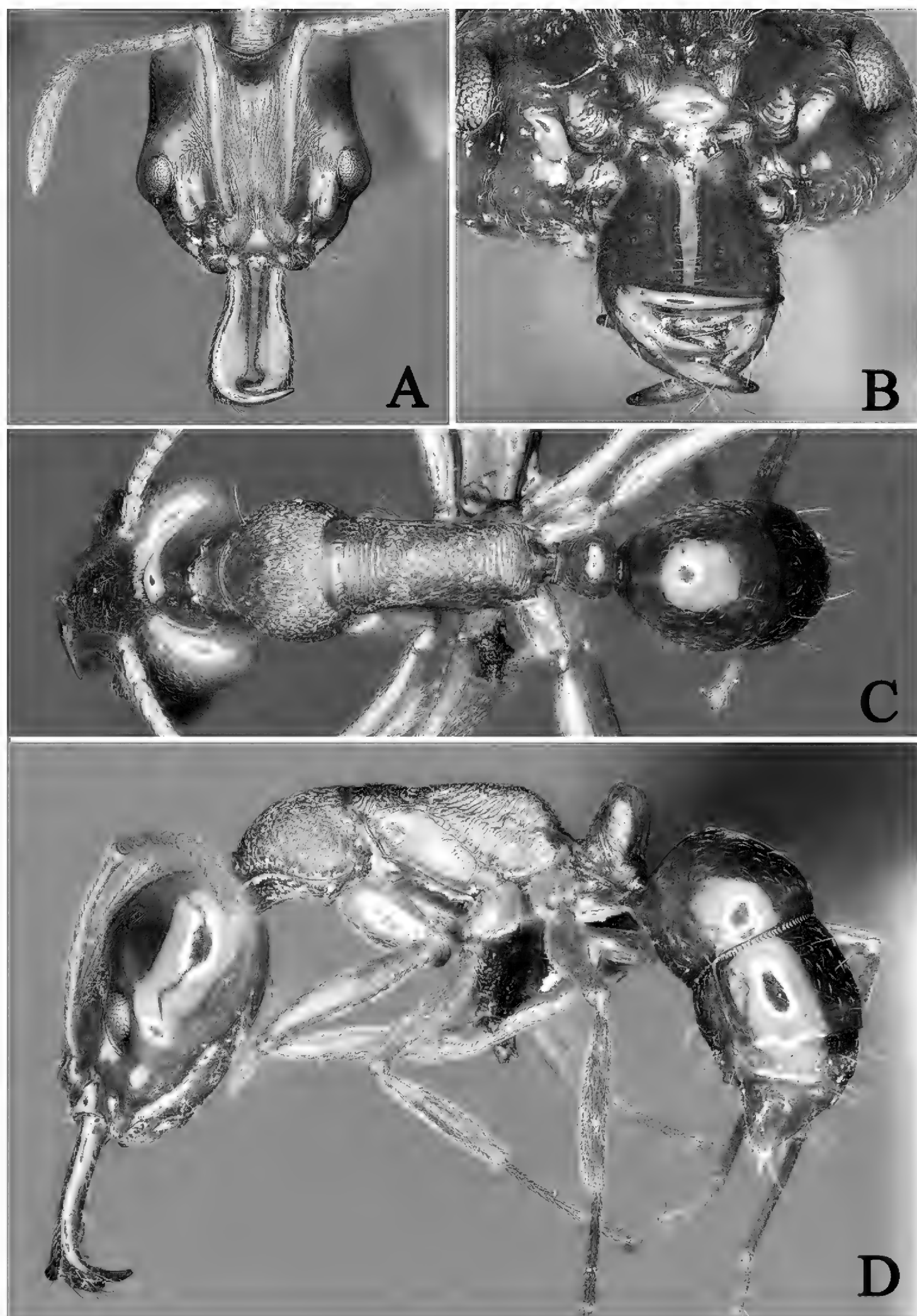
**Distribution.** Known only from the type-locality Fangchenggang of Guangxi in China.

### *Anochetus madaraszi* Mayr, 1897

Fig. 4

*Anochetus madaraszi* Mayr, 1897: 424. [Syntype worker images examined, AntWeb, CSENT0915893, photos by Anna Pal].

**Non-type material examined.** 3 workers, CHINA, Yunan, Xishuangbanna Prefecture, Mengyang Town, Mengyang, 05.X.2016, leg. Chaotai Wei, No. G160654;



**Figure 4.** *Anochetus madaraszi* worker (No. G160654). **A** head in full-face view **B** mandible in anterior view **C** body in dorsal view **D** body in lateral view.

4 workers, CHINA, Guangxi, Longzhou Country, Nonggang, 13.VII.2013, leg. Liwei Liang, No. G130988.

**Workers.** TL 5.12–5.43, HL 1.35–1.39, HW 1.22–1.27, CI 90–92, SL 1.01–1.04, SI 82–84, ED 0.23–0.25, PW 0.69–0.73, MSL 1.53–1.57, PL 0.031–0.33, PH 0.57–0.58, DPW 0.32–0.33, LPI 174–176, DPI 101–103 (n = 5).

In full-face view head slightly longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin without denticles; apical portion with three distinct teeth. Antennae 12-segmented; scapes just reaching to posterior corners of head. Eyes large, maximum diameter wider than basal width of scape.

In lateral view mesosoma stout; pronotum convex. Promesonotal suture weakly concave dorsally. Metanotal groove in lateral view faintly impressed. Dorsum of propodeum straight, posterodorsal corner rounded. Petiole thick, distinctly higher than long, narrowing dorsally, dorsal apex narrowly rounded; anterior margin straight, posterior margin distinctly convex; subpetiolar process developed, subtriangular.

Central dorsum of head and frontal lobes longitudinally striate, remainder of head smooth and shining. Pronotum and propodeal dorsum irregularly rugose. Mesonotum and propodeal declivity transversely striate. Propodeal sides obliquely striate. Mesopleuron smooth and shining. Petiole smooth and shining, basal area obliquely striate. Gaster smooth and shining.

Body dorsum with scattered suberect hairs and sparse decumbent pubescence; scapes and tibiae with dense decumbent pubescence. Body blackish brown to brown; antennae, legs yellowish brown.

**Recognition.** *A. madaraszi* is similar to *A. graeffei* Mayr, 1870, but can be separated from the latter by the following characters: head slight longer than broad (CI 90–92); mesonotum with transversely striate; petiolar node distinctly thick; first gastral tergite smooth and shining.

**Distribution.** Known from Bangladesh, India, Sri Lanka, China: Guangxi and Yunnan (**new record**).

### *Anochetus medogensis* sp. n.

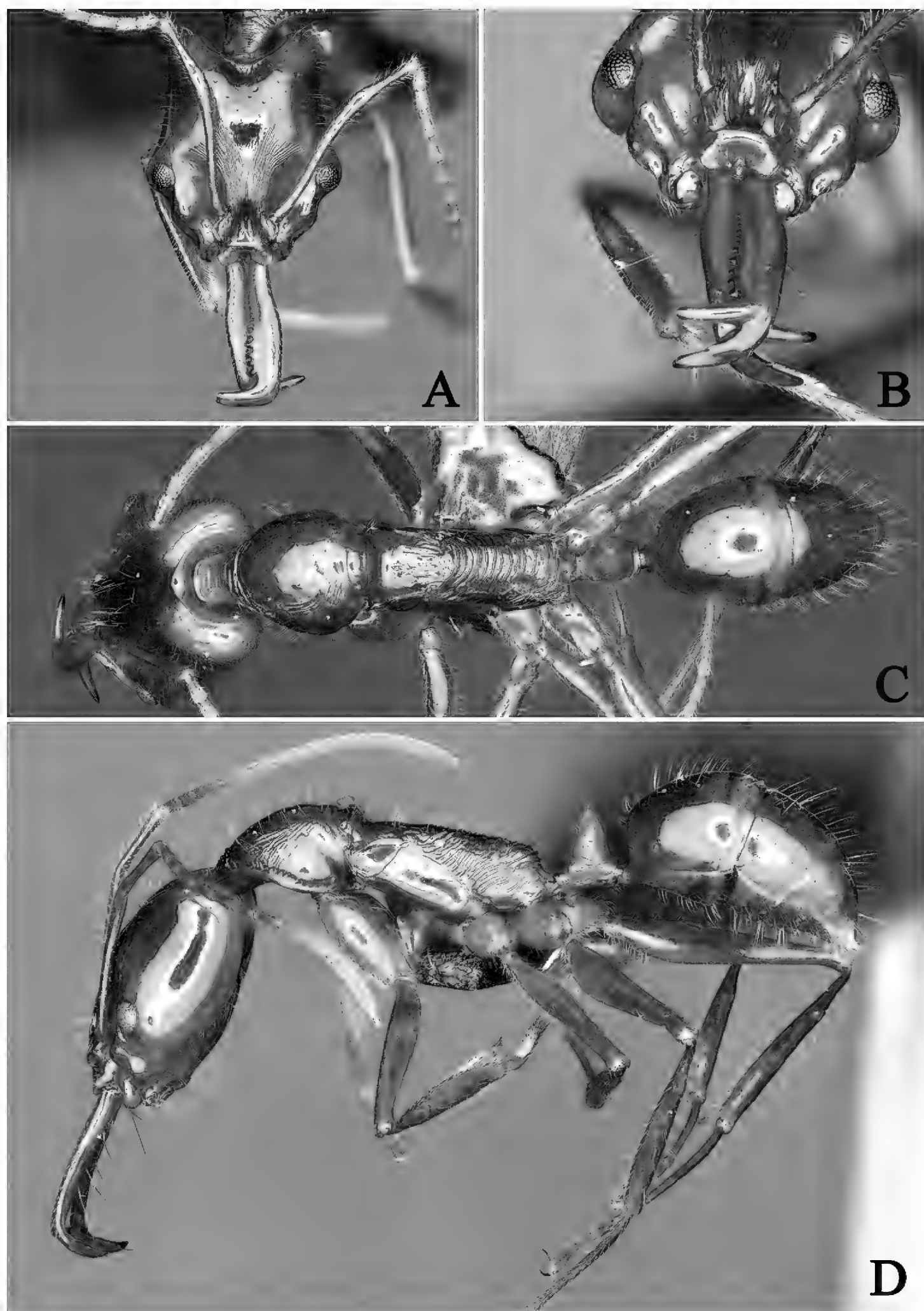
<http://zoobank.org/CED5A5B2-9900-4D7B-9055-3FC254A13F26>

Fig. 5

**Type material.** Holotype worker, CHINA, Tibet, Modog Country, Beibeng Town, Beibeng Village, 29.25N, 95.19E, 840 m, 28.VIII.2016, leg. Zhilin Chen, No. G160581; 9 paratype workers from the same colony. [Holotype worker and 5 paratype worker are deposited in the Insect Collection, Guangxi Normal University, Guilin, China (GXNU); 2 paratype workers will be deposited in the Insect Collection, Southwest Forestry University, Kunming, Yunnan Province, China (SWFU); 2 paratype workers will be deposited in the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS)].

**Holotype worker.** TL 7.86, HL 1.89, HW 1.65, CI 87, SL 1.68, SI 102, ED 0.23, PW 0.92, MSL 2.52, PL 0.47, PH 0.67, DPW 0.36, LPI 143, DPI 76.





**Figure 5.** *Anochetus medogensis* holotype worker (No. G160654). **A** head in full-face view **B** mandible in anterior view **C** body in dorsal view **D** body in lateral view.

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin with 11 denticles; apical five denticles equally sized, remaining denticles gradually decreasing in size towards base; apical portion with three distinct teeth. Clypeus with concave anterior margin, lateral portion forming two round lobes above the base of mandibles. Antennae 12-segmented; scapes long, surpassing to posterior corners of head by 1/10 of its length. Eyes moderately large; maximum diameter of eye equal to the basal width of mandibles.

In lateral view mesosoma slender; pronotum moderately convex. Promesonotal suture narrowly notched. Mesonotum with a transverse ridge anteriorly. Metanotal groove deeply depressed. Dorsum of propodeum almost straight, sloping posteriorly; posterodorsal corner of propodeum narrowly rounded. Petiole cone-shaped, with a pointed dorsal apex, anterior margin slightly longer than posterior margin; subpetiolar process developed, directed posteroventrally as a distinct hook.

Frons longitudinally to obliquely striate posteriorly; remainder of head smooth and shining. Mesosoma smooth and shining, upper portion of lateral pronotum longitudinally striate, metathorax and propodeum obliquely rugose. Petiolar node smooth and shining, basal area faintly striate. Gaster smooth and shining.

Body dorsum with abundant erect to suberect hairs and sparse decumbent pubescence; scapes with sparse suberect hairs and abundant subdecumbent pubescence, tibiae with abundant suberect hairs and sparse decumbent pubescence. Body reddish brown; head, mandibles and antennae blackish brown; legs yellowish brown.

**Paratype workers.** TL 7.35–7.89, HL 1.68–1.89, HW 1.44–1.65, CI 85–87, SL 1.49–1.68, SI 102–103, ED 0.19–0.23, PW 0.83–0.92, MSL 2.21–2.52, PL 0.42–0.47, PH 0.62–0.67, DPW 0.28–0.36, LPI 143–150, DPI 68–76. (n = 9). As holotype.

**Recognition.** The new species is similar to *A. princeps* Emery, 1884, but can be distinguished from the later by the following characters: scapes surpassing to posterior corners of head by 1/10 of its length; petiole cone-shaped, with a pointed dorsal apex.

**Distribution.** Known only from the type-locality Medog of China.

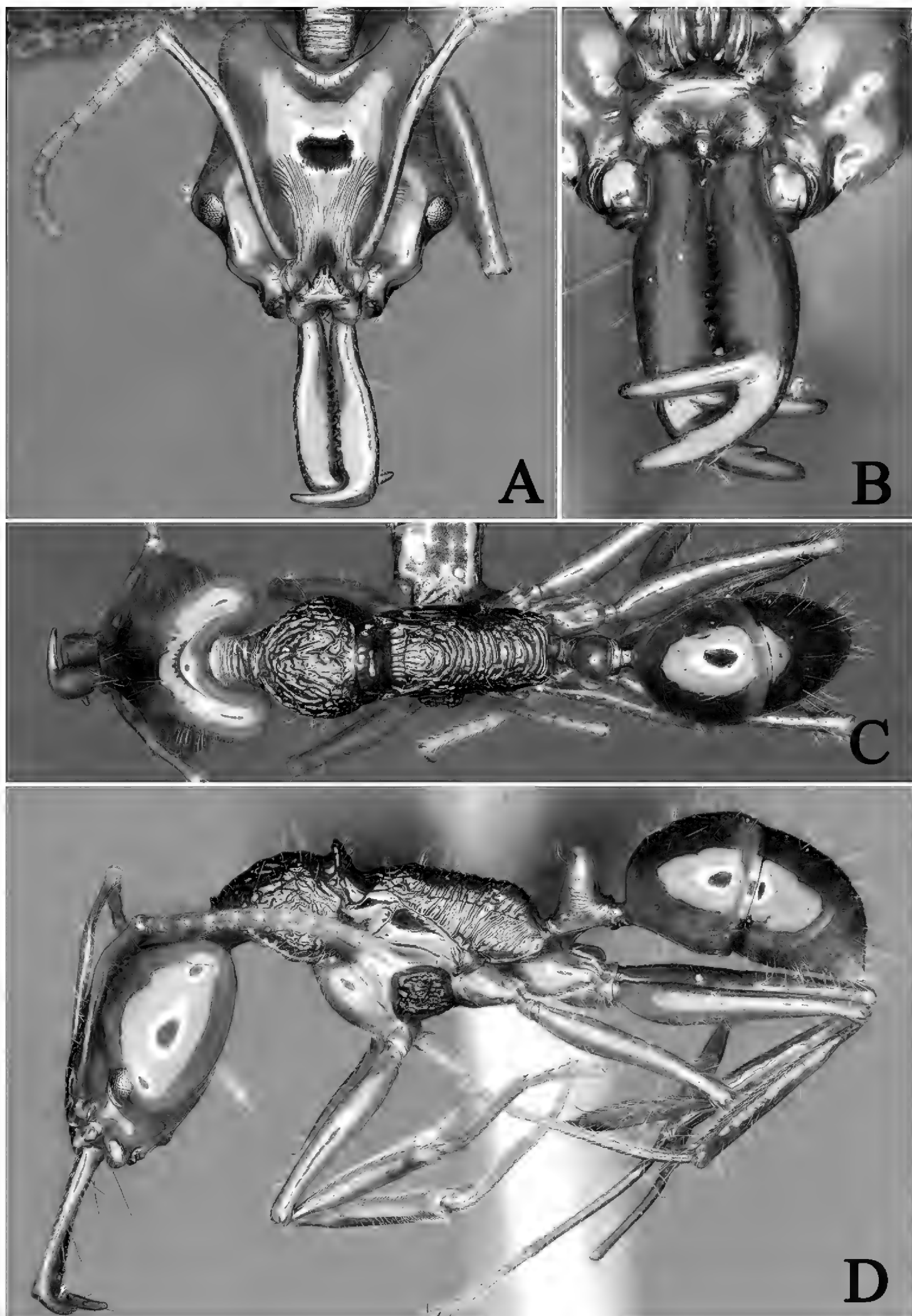
### *Anochetus mixtus* Radchenko, 1993

Fig. 6

*Anochetus mixtus* Radchenko, 1993: 77. [Holotype and paratype worker images examined, AntWeb, CASENT0917205 & SEMUT20160608A, photos by Rijal Satria & Kate Martynova, respectively].

*Anochetus yunnanensis* Wang, M. 1993: 226. Synonymized by Satria, Viet & Eguchi, 2017: 4. [Holotype and paratype workers examined].

**Non-type material examined.** 20 workers, CHINA, Guangxi, Fangchenggang City, Mt. Shiwandashan, 21.81N, 107.95E, 450 m, 24.VI.2014, leg. Zhilin Chen, No. G140095; 10 workers and 1 male, CHINA, Hainan, Ledong Country, Jianfengling, 18.74N, 108.84E, 969 m, 09. IV.2016, leg. Zhilin Chen, No. G15049.



**Figure 6.** *Anochetus mixtus* worker (No. G140095). **A** head in full-face view **B** mandible in anterior view **C** body in dorsal view **D** body in lateral view.

**Workers.** TL 8.41–8.76, HL 2.11–2.14, HW 1.87–1.90, CI 89–91, SL 1.88–1.92, SI 100–101, ED 0.24–0.25, PW 1.05–1.06, MSL 2.68–2.73, PL 0.53, PH 0.83, DPW 0.40, LPI 157, DPI 75 (n=5).

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin with 9–10 denticles; apical portion with two distinct large teeth, sometimes with 1 small additional denticle on the midlength of the ventral tooth. Antennae 12-segmented, scapes just surpassing to posterior corners of head. Eyes moderately large, maximum diameter equal to the basal width of mandibles.

In lateral view mesosoma stout, pronotum moderately convex. Promesonotal suture narrowly notched. Mesonotum with a high transverse ridge anteriorly. Metanotal groove deeply impressed. Dorsum of propodeum straight, sloping posteriorly; posterodorsal corner of propodeum rounded. Petiole roughly cone-shaped and weakly inclined posteriorly, with a blunt and rounded dorsal apex, anterior margin almost straight, posterior margin weakly convex; subpetiolar process subtriangular, directed anteroventrally.

Frons longitudinally to obliquely striate posteriorly; frontal lobes weakly striate, remainder of head smooth and shining. Pronotum irregularly rugose. Dorsum of mesonotum with longitudinal rugae, mesopleuron smooth and shining. Metathorax and propodeum obliquely rugose. Petiole smooth and shining, basal area faintly striate. Gaster smooth and shining. Body dorsum with sparse suberect hairs and sparse decumbent pubescence; scapes with scattered suberect hairs and abundant subdecumbent pubescence, tibiae with sparse suberect hairs and sparse decumbent pubescence. Body reddish brown; antennae and legs yellowish brown.

**Recognition.** *A. mixtus* is similar to *A. rugosus* (Smith, 1857), but can be distinguished from the latter by the following characters: vertex smooth and shining; upper half of petiolar node smooth and shining, basal half weakly striate.

**Distribution.** Known from Vietnam and China: Yunnan, Guangxi and Hainan.

### *Anochetus risii* Forel, 1900

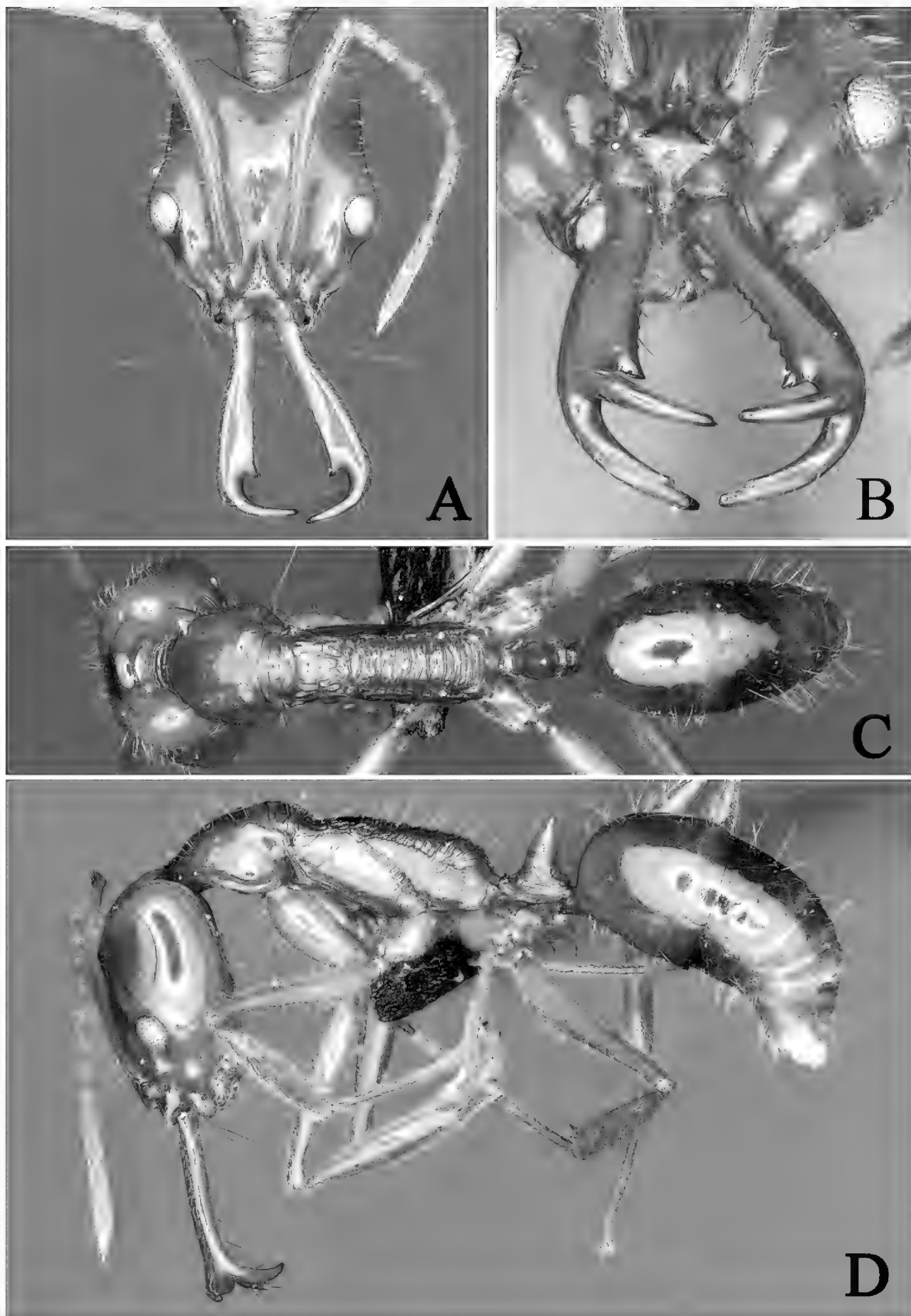
Figs 7–9

*Anochetus risii* Forel, 1900: 60. [Syntype worker images examined, AntWeb, CASENT0907411, photos by Will Ericson].

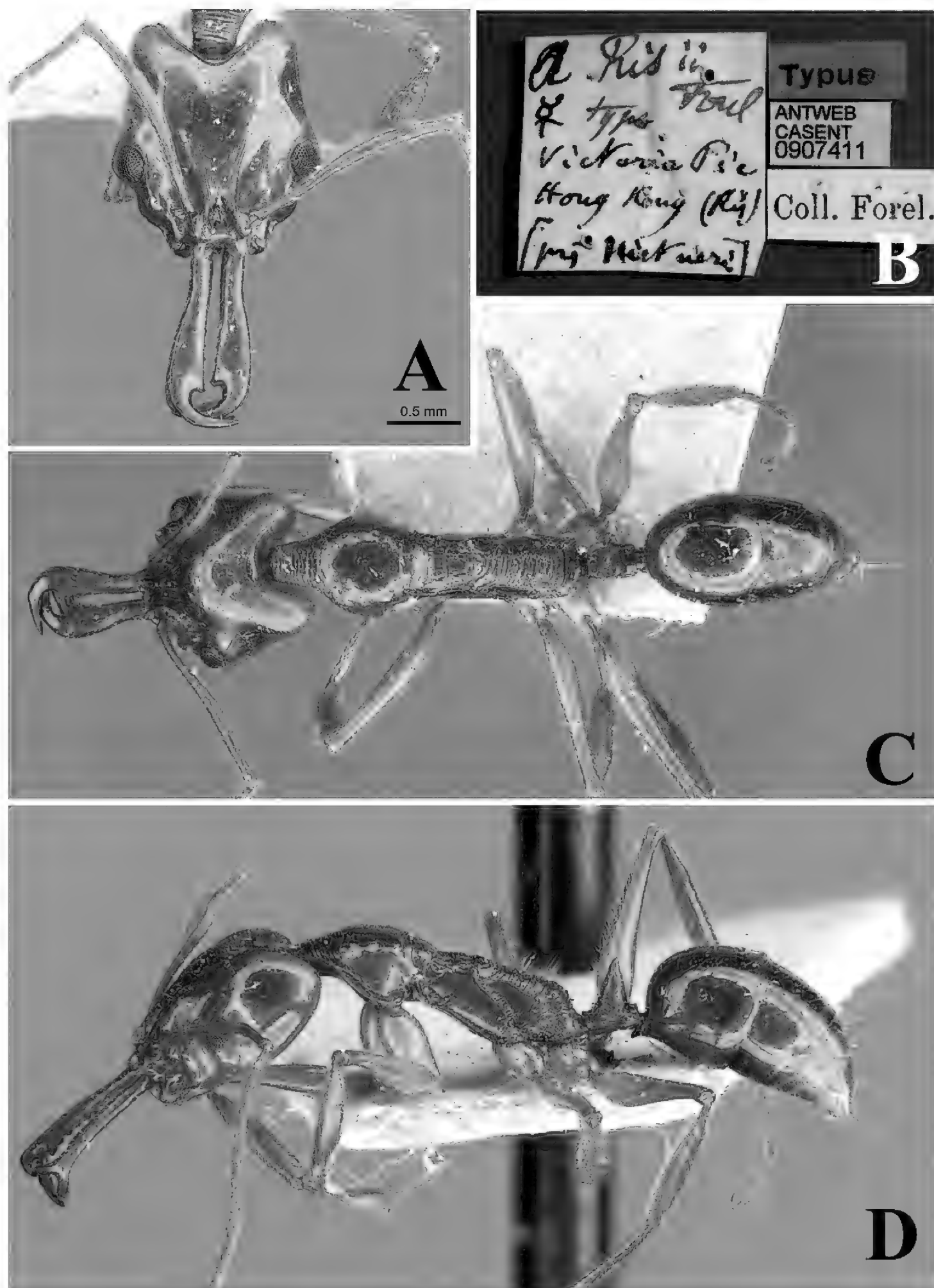
*Anochetus taiwaniensis* Terayama, 1989: 26. [Two paratype worker images examined, AntWeb, CASENT0915167 & CASENT0902440, photos by Will Ericson]. **Syn. n.**

**Non-type material examined.** 1 worker, CHINA, Guangxi, Jinzhongshan Natural Reserve, 7.VIII.2014, leg. Zhilin Chen, No. G140447; 5 workers, CHINA, Guangxi, Beiliu City, Liuma Town, Sanhemaoping, 22. IV.2015, leg. Zhilin Chen; 1 worker, CHINA, Guangdong, Yingde City, Shimentai, 14.VIII.2000, leg. Jianhua Huang; 1 worker, CHINA, Guangdong, Nankunshan, 11.VII.2009, leg. Xinbing Yan; 2 workers, CHINA, Guangxi, Nonggang, 14.X.2007, leg. Chang Lin, No. G070219; 1 worker, CHINA, Hunan, Anhua Country, Hongyan, 14.VII.2004, leg. Jianhua Huang.

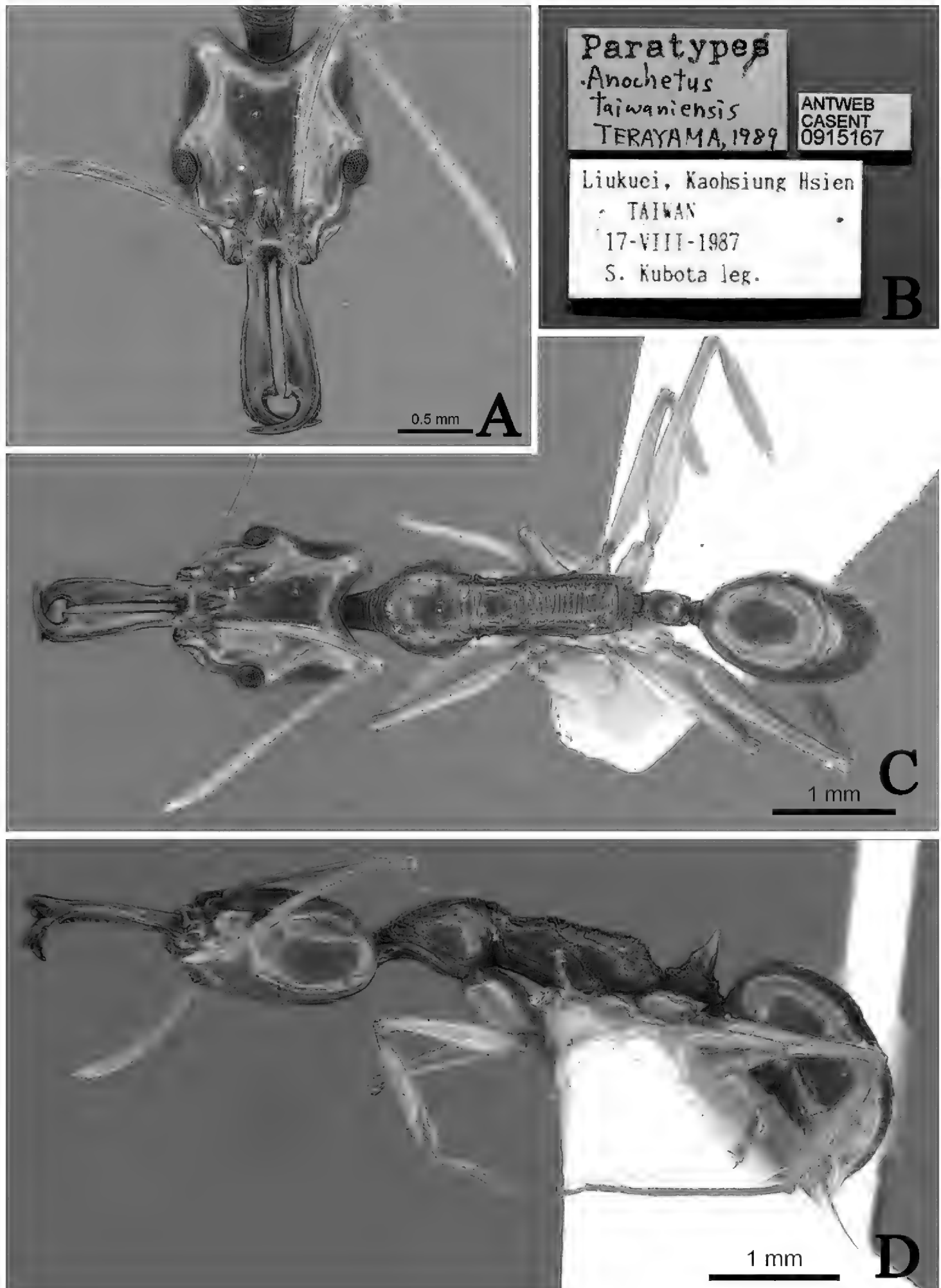




**Figure 7.** *Anochetus risii* worker (No. G140447). **A** head in full-face view **B** mandible in anterior view **C** body in dorsal view **D** body in lateral view.



**Figure 8.** *Anochetus risii* worker (Syntype, AntWeb, CASENT0907411, photos by Will Ericson). **A** head in full-face view **B** labels **C** body in dorsal view **D** body in lateral view.



**Figure 9.** *Anochetus taiwaniensis*, syn. n. (Paratype, AntWeb, CASENT0915167, photos by Will Ericson). **A** head in full-face view **B** labels **C** body in dorsal view **D** body in lateral view.

**Workers.** TL 5.12–5.34, HL 1.67–1.69, HW 1.44–1.46, CI 85–87, SL 1.55–1.57, SI 106–108, ED 0.11–0.12, PW 0.80–0.82, MSL 2.33–2.36, PL 0.37–0.39, PH 0.74–0.76, DPW 0.30–0.32, LPI 202–207, DPI 83–85 (n = 5).

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin with several denticles, gradually decreasing in size towards base; apical portion with three distinct teeth. Antennae 12-segmented; scapes surpassing to posterior corners of head by about 1/5 of its length. Eyes large, maximum diameter of eye wider than the basal width of mandibles.

In lateral view mesosoma slender. Pronotum weakly convex. Promesonotal suture shallowly impressed. Mesonotum weakly convex, sloping posteriorly. Metanotal groove deeply concave. Dorsum of propodeum almost straight, posterodorsal corner bluntly angled. Petiole cone-shaped and slightly inclined posteriorly, with a pointed dorsal apex, anterior margin weakly convex, posterior margin almost straight; subpetiolar process triangular, directed posteroventrally.

Frons longitudinally to obliquely striate posteriorly; frontal lobes and clypeus weakly striate, remainder of head smooth and shining. Mesosoma smooth and shining, propodeum and lower part of metapleuron obliquely rugose. Sometimes sides of pronotum weakly longitudinal rugose. Petiole smooth and shining, basal area weakly striate. Gaster smooth and shining. Body dorsum with abundant erect to suberect hairs and dense decumbent pubescence; scapes and tibiae with scattered suberect hairs and dense decumbent pubescence. Body blackish brown; antennae and legs yellowish brown.

**Recognition and discussion.** After detailed comparison of type worker images of *A. risii* (CASENT0907411) and *A. taiwaniensis* (CASENT0902440 & CASENT0915167), we noticed that both species have completely consistent characters in head, mandibles, antennae, eyes, mesosoma, petiole and measurement range. Terayama (1989) pointed out that *A. taiwanensis* is distinguished from *A. risii* by “broader mandibular shafts and small denticles of the dorsal inner margin of the mandible in the former”. However, we are unable to recognize these differences. The only difference between them is that *A. taiwaniensis* has the pronotum weakly rugose laterally. Consequently, we consider it safe to propose *A. taiwaniensis* as a junior synonym of *A. risii* here.

**Distribution.** Known from Vietnam, Indonesia and Southern China.

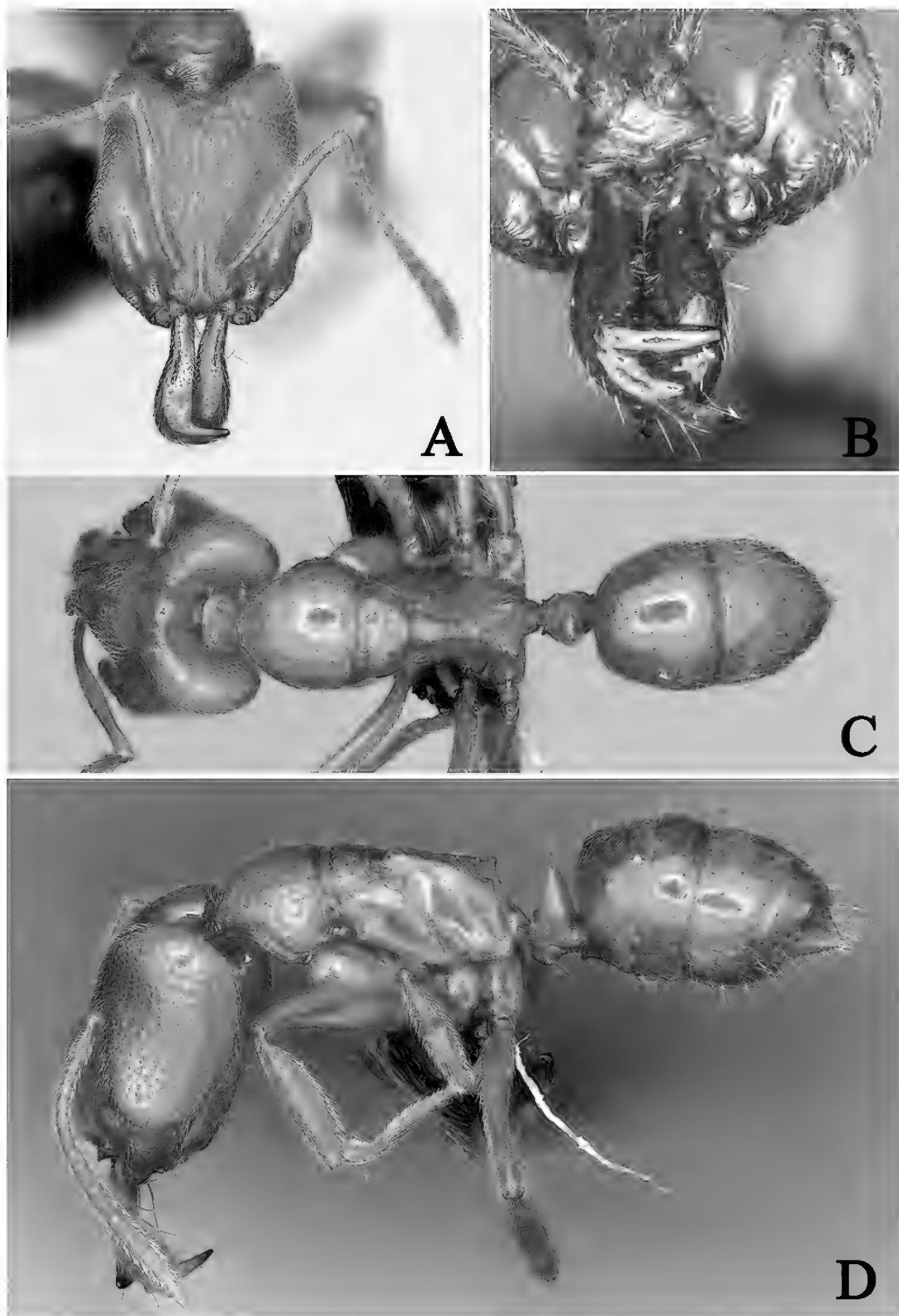
### *Anochetus subcoecus* Forel, 1912

Fig. 10

*Anochetus subcoecus* Forel, 1912. [Type worker images examined, AntWeb, FO-COL0345, photos by Christiana Klingenberg].

**Non-type material examined.** 5 workers, CHINA, Tibet, Medog Country, Medog Village, 29.32N, 95.34E, 1230 m, 27.VIII.2016, leg. Zhilin Chen, No. G160632; 1 worker, CHINA, Guangxi, Fangchenggang City, Mt. Shiwandashan, 21.18N, 107.95E, 450 m, 24.VI.2014, leg. Zhilin Chen, No. G140055.





**Figure 10.** *Anochetus subcoecus* worker (No. G160632). **A** head in full-face view **B** mandible in anterior view **C** body in dorsal view **D** body in lateral view.

**Workers.** TL 4.90–5.34, HL 1.05–1.11, HW 0.94–0.97, CI 85–87, SL 0.80–0.83, SI 82–84, ED 0.08–0.09, PW 0.54–0.56, MSL 1.16–1.19, PL 0.20–0.21, PH 0.44–0.45, DPW 0.24–0.26, LPI 246–250, DPI 118–121 (n = 5).

In full-face view head longer than broad, posterior margin strongly concave. Mandibles linear, gradually broadened apically; inner margin without denticles; apical portion with three distinct teeth. Antennae 12-segmented; scapes short, not reaching to posterior corner of head. Eyes very small.

In lateral view mesosoma stout. Pronotum moderately convex. Promesonotal suture narrowly impressed. Dorsal margin of mesonotum nearly straight, weakly sloping posteriorly. Metanotal groove weakly concave. Dorsum of propodeum almost straight, posterodorsal corner with a pair of short blunt teeth. Petiole thin and erect, long triangle shaped, narrowing apically, anterior margin straight, posterior margin weakly convex, dorsal margin acute; subpetiolar process developed, nearly rectangular and angled ventrally.

Frons and vertex longitudinally striate, remainder of head punctate, frontal lobes weakly striate, clypeus and antennal scrobes smooth and shining. Mesosoma, petiole and gaster smooth and shining, propodeum weakly punctate.

Dorsum of head with scattered suberect hairs and dense subdecumbent pubescence; dorsa of mesosoma and gaster with abundant suberect hairs and abundant decumbent pubescence; scapes and tibiae with dense subdecumbent pubescence. Body yellowish brown.

**Recognition.** This species can be easily separated from other named species of this genus by its very small eyes and distinct propodeal teeth.

**Distribution.** Known from China (Taiwan, Guangxi, Yunnan, Tibet).

### Revival of the valid status of *Anochetus gracilis*

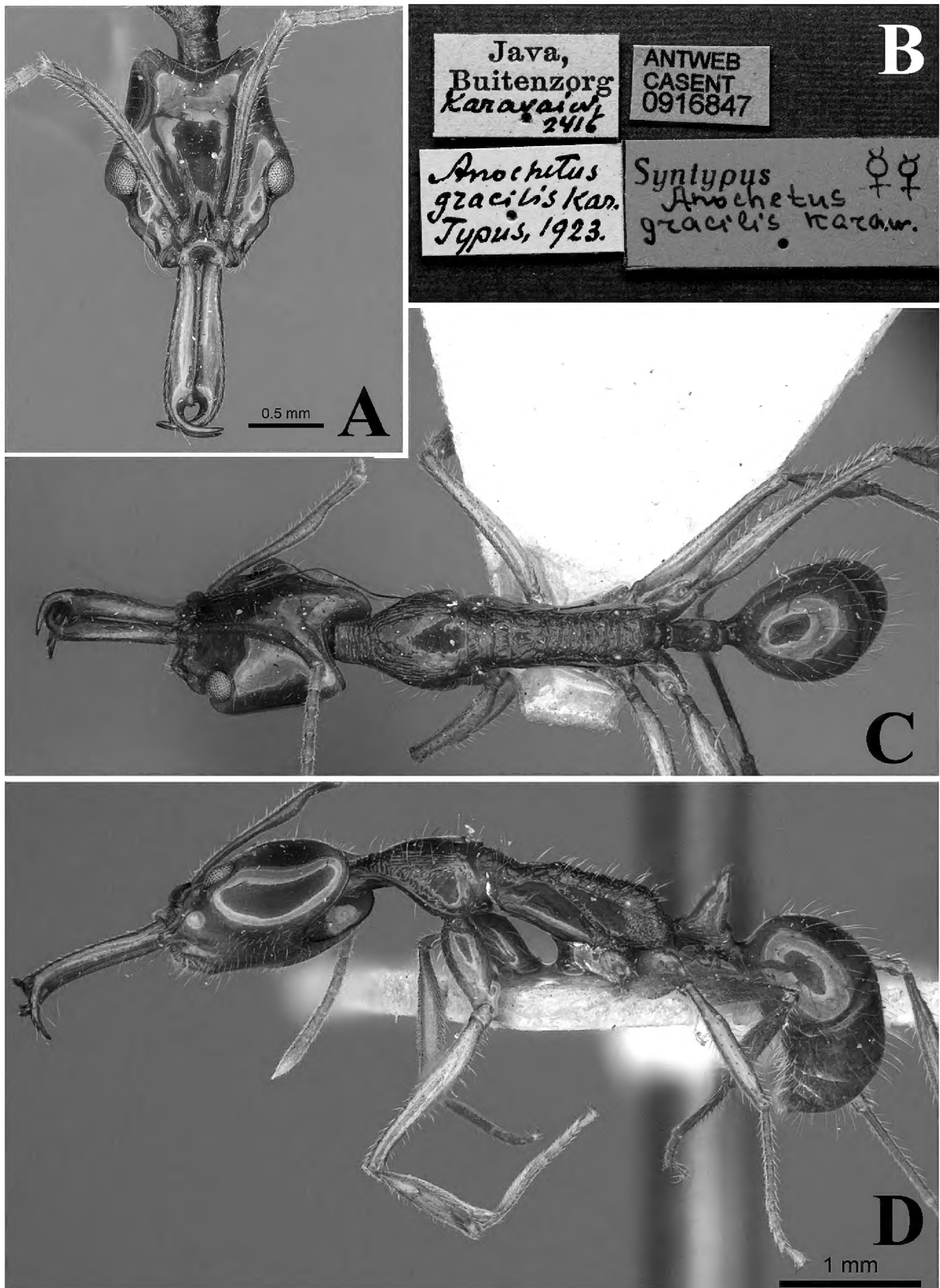
*Anochetus gracilis* Karavaiev, 1925, stat. n.

Fig. 11

*Anochetus gracilis* Karavaiev, 1925: 286. Junior synonym of *Anochetus risii*: Brown, 1978: 558.

**Material examined.** Two syntype worker images examined, AntWeb, CASENT0916847 & CASENT0915166, photos by Will Ericson.

**Recognition and discussion.** After observation of the syntype worker images of *A. risii* (Fig. 8) and *A. gracilis* (Fig. 11) from AntWeb, we find that there are clear differences between them: 1) inner margin of mandibles has no denticles in the worker of *A. gracilis*, but possesses several distinct denticles in the worker of *A. risii*; 2) the maximum diameter of eye is much larger than the maximum width of mandible in the worker of *A. gracilis*, but smaller than or just equal to maximum width of mandible in the worker of *A. risii*; 3) pronotal sides distinctly striate in the worker of *A. gracilis*,



**Figure 11.** *Anochetus gracilis* worker (Syntype, AntWeb, CASENT0916847, photos by Will Kate Martynova). **A** head in full-face view **B** labels **C** body in dorsal view **D** body in lateral view.

but smooth and shining in the worker of *A. risii*. Therefore, the status of *A. gracilis* is restored from the synonymy of *A. risii* here.

**Distribution.** Known from Indonesia (Java).

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## References

- Baroni Urbani C (1980) *Anochetus corayi* n. sp., the first fossil Odontomachiti ant. (Amber Collection Stuttgart: Hymenoptera, Formicidae. II: Odontomachiti). Stuttgarter Beiträge zur Naturkunde, Serie B (Geologie und Paläontologie) 55: 1–6.
- Bharti H, Wachkoo AA (2013) Two new species of trap jaw ant *Anochetus* (Hymenoptera: Formicidae), with a key to known species from India. Journal of Asia–Pacific Entomology 16: 137–142. <https://doi.org/10.1016/j.aspen.2012.12.008>
- Bolton B (2018) An online catalog of the ants of the world. <http://antcat.org/> [Accessed 30 Sep. 2018]
- Bolton B (1975) A revision of the ant genus *Leptogenys* Roger (Hymenoptera: Formicidae) in the Ethiopian region with a review of the Malagasy species. Bulletin of the British Museum (Natural History). Entomology 31: 235–305.
- Brown Jr WL (1978) Contributions toward a reclassification of the Formicidae. Part VI. Ponerinae, tribe Ponerini, subtribe Odontomachiti. Section B. Genus *Anochetus* and bibliography. Studia Entomologica 20: 549–638.
- De Andrade ML (1994) Fossil Odontomachiti ants from the Dominican Republic (Amber Collection Stuttgart: Hymenoptera, Formicidae. VII: Odontomachiti). Stuttgarter Beiträge zur Naturkunde. Serie B (Geologie und Paläontologie) 199: 1–28.
- Emery C (1889) ormiche di Birmania e del Tenasserim raccolte da Leonardo Fea (1885–87). [part]. Annali del Museo Civico di Storia Naturale 27[=(2)7]: 485–512.
- Emery C (1897) Formicidarum species novae vel minus cognitae in collectione Musaei Nationalis Hungarici quas in Nova–Guinea, colonia germanica, collegit L. Biró. Természetrájsi Füzetek 20: 571–599.
- Feitosa RM, Lacau S, Da Rocha WD, Oliveira AR, Delabie JHC (2012) A giant new arboreal species of the ant genus *Anochetus* from Brazil (Formicidae: Ponerinae). Annales de la Société Entomologique de France (NS) 48: 253–259.
- Fisher BL, Smith MA (2008) A revision of Malagasy species of *Anochetus* Mayr and *Odontomachus* Latreille (Hymenoptera: Formicidae). PLoS ONE 3(5): e1787. <https://doi.org/10.1371/journal.pone.0001787>



- Forel A (1900) Les Formicides de l'Empire des Indes et de Ceylan. Part VI. Journal of the Bombay Natural History Society 13: 52–65.
- Forel A (1912) H. Sauter's Formosa–Ausbeute. Formicidae (Hym.). Entomologische Mitteilungen (Berlin & Dahlem) 1: 45–61.
- González-Campero MC, Elizalde L (2008) A new species of *Anochetus* (Hymenoptera: Formicidae: Ponerini) from Argentina and Paraguay, associated with leaf cutter ants. Entomotropica 23: 97–102.
- Hua LZ (2006) List of Chinese insects Vol. IV. Sun Yat-sen University Press, Guangzhou, 262–273.
- Karavaiev V (1925) Ponerinen (Fam. Formicidae) aus dem Indo-Australischen Gebiet. (Schluss). Konowia 4: 276–296.
- Kugler J, Ionescu A (2007) *Anochetus bytinskii*, a new ant species from Israel (Hymenoptera: Formicidae). Israel Journal of Entomology 37: 287–298.
- Lattke JE (1987) Two new species of neotropical *Anochetus* Mayr (Hymenoptera: Formicidae). Insectes Sociaux 33: 352–358. <https://doi.org/10.1007/BF02224250>
- Leong CM, Tsai WH, Terayama M, Shiao S, Lin CC (2018) Description of a new species of the genus *Anochetus* Mayr (Hymenoptera: Formicidae) from Orchid Island, Taiwan. Journal of Asia-Pacific Entomology 21: 124–129. <https://doi.org/10.1016/j.aspen.2017.11.003>
- Lyu D (2008) Taxonomic study on the Poneromorph subfamilies group (Hymenoptera: Formicidae) in Korea. Korean Journal of Applied Entomology 47: 315–331. <https://doi.org/10.5656/KSAE.2008.47.4.315>
- MacKay WP (1991? 1990). *Anochetus brevidentatus*, new species, a second fossil Odontomachiti ant (Hymenoptera: Formicidae). Journal of the New York Entomological Society 99: 138–140.
- Marathe A, Priyadarsanan DR (2016) A novel ant species of the genus *Anochetus* (Hymenoptera: Formicidae) from India with a remarkable nest entrance architecture. Current Science (Bangalore) 110: 1105–1107. <https://doi.org/10.18520/cs/v110/i6/1105-1107>
- Mayr G (1870) Neue Formiciden. Verhandlungen der Kaiserlich–Königlichen Zoologisch–Botanischen Gesellschaft in Wien 20: 939–996.
- Mayr G (1879) Beiträge zur Ameisen–Fauna Asiens. Verhandlungen der Kaiserlich–Königlichen Zoologisch–Botanischen Gesellschaft in Wien 28: 645–686.
- Mayr G (1897) Formiciden aus Ceylon und Singapur. Természetrájsi Füzetek 20: 420–436.
- Nuril Aida KI, Idris AB (2011) *Anochetus maryatiae*, a new species of Ponerinae (Hymenoptera: Formicidae). Sains Malaysiana 40: 301–304.
- Radchenko AG (1993) Ants from Vietnam in the collection of the Institute of Zoology, PAS, Warsaw. I. Pseudomyrmicinae [sic], Dorylinae, Ponerinae. Annales Zoologici (Warsaw) 44: 75–82.
- Satria R, Viet BT, Eguchi K (2017) New synonymy and redescription of *Anochetus mixtus* Radchenko, 1993, and distinction from the other members of the *Anochetus rugosus* group (Hymenoptera: Formicidae: Ponerinae). Asian Myrmecology 9: e009006.
- Schmidt C (2013) Molecular phylogenetics of ponerine ants (Hymenoptera: Formicidae: Ponerinae). Zootaxa 3647: 201–250. <https://doi.org/10.11646/zootaxa.3647.2.1>

- Sharaf MR, Monks J, Aldawood SA, Polaszek A (2017) *Anochetus* (Hymenoptera: Formicidae) in the Arabian Peninsula, with description of a new species from Oman. *Proceedings of the Entomological Society of Washington* 119(1): 78–89. <https://doi.org/10.4289/0013-8797.119.1.78>
- Shattuck SO, Slipinska E (2012) Revision of the Australian species of the ant genus *Anochetus* (Hymenoptera: Formicidae). *Zootaxa* 3426: 1–28.
- Tang J, Li S, Huang E, Zhang B, Chen Y (1995) Economic insect fauna of China. Fasc. 47. Hymenoptera: Formicidae (1). Academy of Science Publishing House, Beijing. 134 pp. [In Chinese]
- Terayama M (1989) The ant tribe Odontomachini (Hymenoptera: Formicidae) from Taiwan, with a description of a new species. *Edaphologia* 40: 25–29.
- Terayama M (1996) Taxonomic studies on the Japanese Formicidae, part 2. Seven genera of Ponerinae, Cerapachyinae and Myrmicinae. *Nature & Human Activities* 1: 9–32.
- Terayama M (2009) A synopsis of the family Formicidae of Taiwan (Insecta, Hymenoptera). *The Research Bulletin of Kanto Gakuen University*, 17: 81–266.
- Wang M (1993) Taxonomic study of the ant tribe Odontomachini in China (Hymenoptera: Formicidae). *Scientific Treatise on Systematic and Evolutionary Zoology* 2: 219–230. [In Chinese]
- Wilson EO (1959) Studies on the ant fauna of Melanesia V. The tribe Odontomachini. *Bulletin of the Museum of Comparative Zoology* 120: 483–510.
- Wheeler WM (1928) Ants collected by Professor F. Silvestri in China. *Bollettino del Laboratorio di Zoologia Generale e Agraria della Reale Scuola Superiore d'Agricoltura*. Portici 22: 3–38.
- Wheeler WM (1930) A list of the known Chinese ants. *Peking Natural History Bulletin* 5: 53–81.
- Wu J, Wang C (1995) The ants of China. Beijing: China Forestry Publishing House, 214 pp. [In Chinese]
- Xu Z, Yang Z, Yu X (1998) Three Ponerinae species newly recorded in China and new distribution of *Ponera sinensis* (Hymenoptera: Formicidae). *Journal of Southwest Forestry College* 18: 221–226. [In Chinese]
- Xu Z. (1999) An analysis on the ant fauna of the tropical rain forest in Xishuangbanna of China. *Zoological Research* 20: 379–384.
- Xu Z, Zeng G, Liu TY, He YF (1999) A study on communities of Formicidae ants in different subtypes of vegetation in Xishuangbanna District of China. *Zoological Research* 20: 118–125.
- Xu ZH (2002) A study on the biodiversity of Formicidae ants of Xishuangbanna Nature Reserve. Yunnan Science and Technology Press, Kunming, 181 pp.
- Zhang X, Hou YM (2009) Five new record genus and thirty one new records species of ants (Hymenoptera: Formicidae) in Fujian Province. *Journal of Fujian Agriculture and Forestry University* 38: 479–484.
- Zettel H (2012) New trap-jaw ant species of *Anochetus* Mayr, 1861 (Hymenoptera: Formicidae) from the Philippine Islands, a key and notes on other species. *Myrmecological News* 16: 157–167.
- Zhou S (2001) Ants of Guangxi. Guangxi Normal University Press, Guilin, 255 pp.